BIOTECHNOLOGY

Modification of the genetic machinery of living cells to alter the chemical or physical nature of the organism or to produce useful biochemicals. The production of high value-added biological products on a commercial scale.

Status:

Biotechnology has produced plant modifications, biosensors, new and efficient separation and purification methods, new or better techniques to produce natural and/or new biochemicals and more efficient bioprocesses. Commercial applications have been hampered by difficulties in controlling large scale bio-processes and making large scale separations. More fundamental problems center on needs for measurement tools and for improved knowledge of cellular processes and protein structure/function relationships.*

Likely Scenario:

Biotechnology markets in pharmaceuticals, foods, flavors, fragrances, agrichemicals, commodities, fuels and pollution abatement are estimated by the U.S. Department of Commerce to reach a world market of $40B by the year 2000*.

The market for modified tobacco plants is probably too small and fragmented to attract commercial interest outside of tobacco companies. However the external development of biopesticides, drought resistant plants or "natural" anti-suckering agents may contribute to tobacco quality and/or production. Japan Tobacco Inc. is known to be developing a broad base of biotechnology, not necessarily related to tobacco or smoking product applications.

Recent demonstrations of the use of bacteria to install traits of interest into specific plants suggest the possibility of introducing or inhibiting a specific physical characteristic or a chemical component. Since the bacteria die with the plants, the traits are not passed on to future generations and no permanent alteration of the environment is effected. Thus traits of interest could be installed by the farmer, using a spraying operation. Further development of this technology is highly probable.

Alternate Scenario:

Breakthroughs in the fundamental understanding of biochemical structure/function relationships could produce radical changes in the nature and effectiveness of biotechnology.

PM Response:

As one of the fastest growing areas of science, biotechnology demands our continuing attention. R&D is pursuing the use of anti-sense techniques to reduce or eliminate the expression of specific products (alkaloids) in tobacco. We are actively investigating the new results (above) in the use of bacteria or viruses for the transient expression of desirable traits (reduced alkaloids, improved flavor.) Work is also in progress on the enzyme degradation of nicotine in gas or aqueous streams.

Members of the Biochemical Research Division continually monitor developments in biotechnology. These include homologous recombination (gene alteration), the use of microorganisms to introduce biopesticides and methods of gene introduction such as "gene guns," or microinjection techniques.